

Staying Afloat

When heavily laden cargo ships go from the salt water of the ocean to fresh water regions, there could be a concern about sinking. Why might a ship that is able to float in the ocean be unable to stay afloat in fresh water?

Your Task

You and your partner will design and conduct an experiment to explore how the amount of salt dissolved in water (salinity) affects the degree to which objects stay afloat. Salinity is the concentration of salt dissolved in water. For example, the average salinity of Long Island Sound is approximately 2.5 grams of salt dissolved in 100 mL of water (2.5 g/100 mL). You will be asked to use the results of your experiment to determine the salinity of a water sample.

During this activity you will work with a partner (or possibly two partners). However, you must keep your own individual lab notes because after you finish you will work independently to write a report about your investigation.

You have been provided with the following materials and equipment. It may not be necessary to use all of the equipment that has been provided. You may use additional materials and equipment if they are available.

Salt (NaCl)	400 mL Beaker
1 Teaspoon	Graduated cylinder
3 Large plastic cups	1 Plastic ruler
4 Small plastic cups	1 Plastic vial with cap
20 Paper clips	1 Paper ruler
3 Stirring rods	20 Small washers
Labeling dots	
Access to masking tape	
Access to a balance	
Access to tap water	
Paper towels for cleanup	
Splash-proof safety goggles for each student	
Apron for each student	

Steps to Follow

Part I

1. **In your own words, clearly state the problem you are going to investigate.** Include a clear identification of the independent and dependent variables that will be studied. Write your statement of the problem on page 4.
2. **Design an experiment to solve the problem.** Your experimental design should match the statement of the problem, should control for variables, and should be clearly described so that someone else could easily replicate your experiment. Include a control if appropriate.

The small plastic cups or vial can be used as the model for the ship. The washers and paper clips can be used as the ship's cargo.
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Write your experimental design on page 4. Show your design to your teacher before you begin your experiment.

3. **After receiving approval from your teacher, work with your partner to carry out your experiment.** Your teacher's approval does not necessarily mean that your teacher thinks your experiment is well designed. It simply means that in your teacher's judgment your experiment is not dangerous or likely to cause an unnecessary mess.
4. **While conducting your experiment, take notes on the attached pages.** Include the results of your experiment. Tables, charts and/or graphs should be used where appropriate and should be properly labeled. Space for your data is provided on page 8.

Part II

5. **After conducting your experiment, obtain a sample of water that contains an unknown amount of salt.** Use the data you collected to determine the salinity of this water sample.

Your notes will **not** be scored, but they will be helpful to you later as you work independently to write about your experiment and results. You must keep your own notes because you will not work with your partner when you write your lab report.

When you have finished, your teacher will give you instructions for clean up procedures, including proper disposal of all materials.

Directions for Writing Your Laboratory Report

Working on your own, summarize your experiment and results. You may use your own notes that you took previously while working with your partner. Space for your final report is provided on the following pages in this booklet. You will have approximately 30 minutes to complete your report.

Your report should include the following:

- **A clear statement of the problem you investigated.** Include a clear identification of the independent and dependent variables that were studied.
- **A description of the experiment you carried out.** Your description should be clear and complete enough so that someone else could easily replicate your experiment.
- **The results of your experiment.** Tables, charts and/or graphs should be used where appropriate and should be properly labeled. Space for your data is provided on page 15.
- **Your conclusions from the experiment.** Your conclusions should be fully supported by data.
- **Comments about how valid you think your conclusions are.** In other words, how much confidence do you have in your results and conclusions? Any factors that contribute to a lack of confidence in the results or conclusions should be discussed. Also, include ways that your experiment could be improved if you were to do it again.